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Philadelphia Engineering Works, Limited,

STEEL PLATE CHIMNEYS,

IRON TANKS, STAND PIPES,

STEEL BUILDINGS, BLAST FURNACE EQUIPMENT,

Gordon-Whitwell-Cowper Fire-Brick Hot-Blast Stoves,

Long Distance
Telephone
1781.

PHILADELPHIA CORLISS ENGINES,

BLOWING ENGINES, AIR AND GAS COMPRESSORS.

THE ASPINGOOK COMPANY
JEWETT CITY, CONN.
6 X 100 FEET

HARTMAN GENERAL ELECTRIC CO.
DULUTH, MINN.
7-6 X 200 FEET

EAST RIVER GAS CO.
LONG ISLAND CITY, N.Y.
7-4 X 150 FEET

LIBRARY
FRANKLIN

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CATALOGUE E.

STEEL PLATE = =

= = CHIMNEYS

Philadelphia Engineering Works, Limited,
ENGINEERS,
MANUFACTURERS, CONSTRUCTORS.

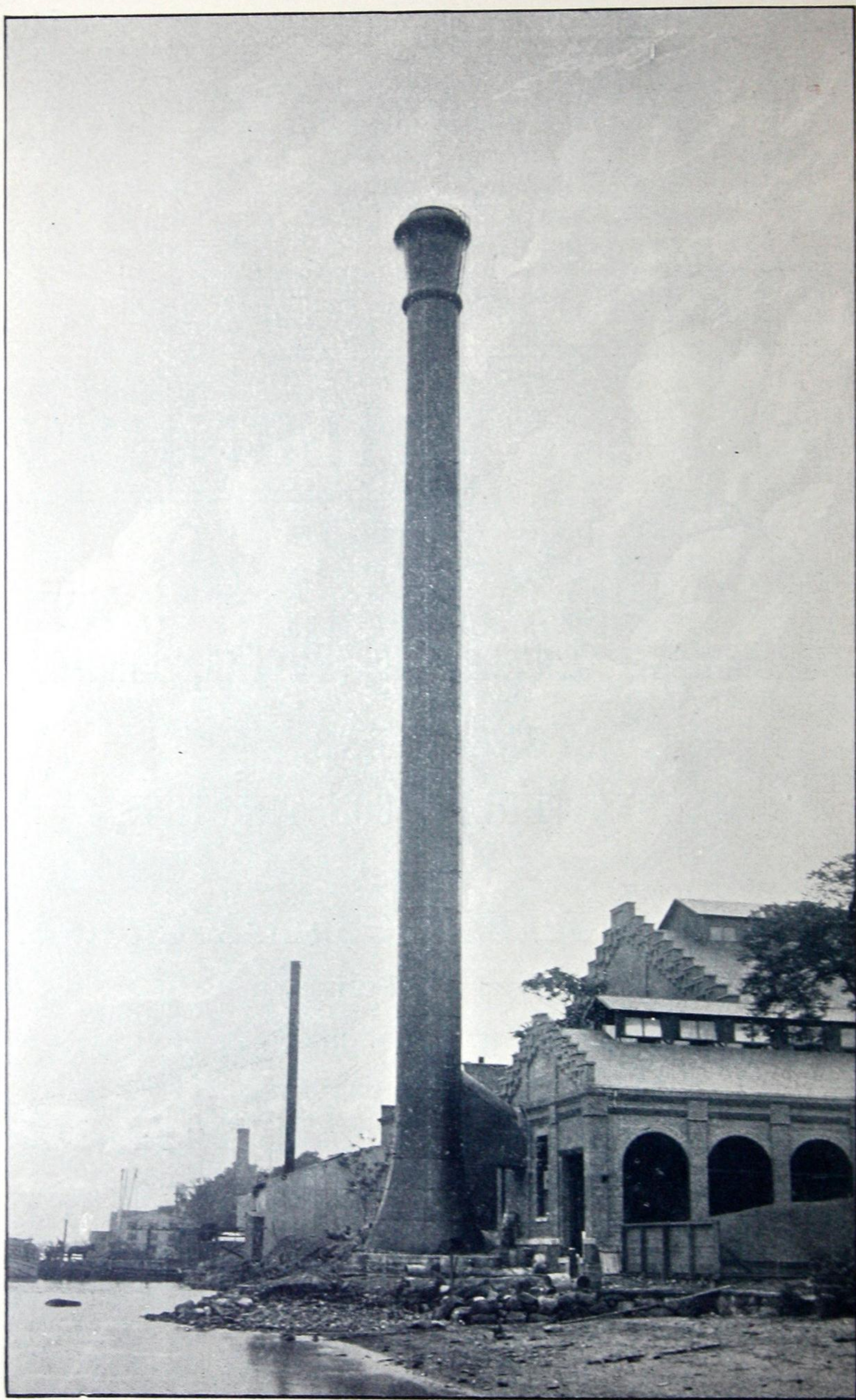
Builders of

THE PHILADELPHIA CORLISS ENGINE,
Condensers, Air Pumps,
Feed Water Heaters,
Gas and Air Compressors,
Water Tube and Tubular Boilers.

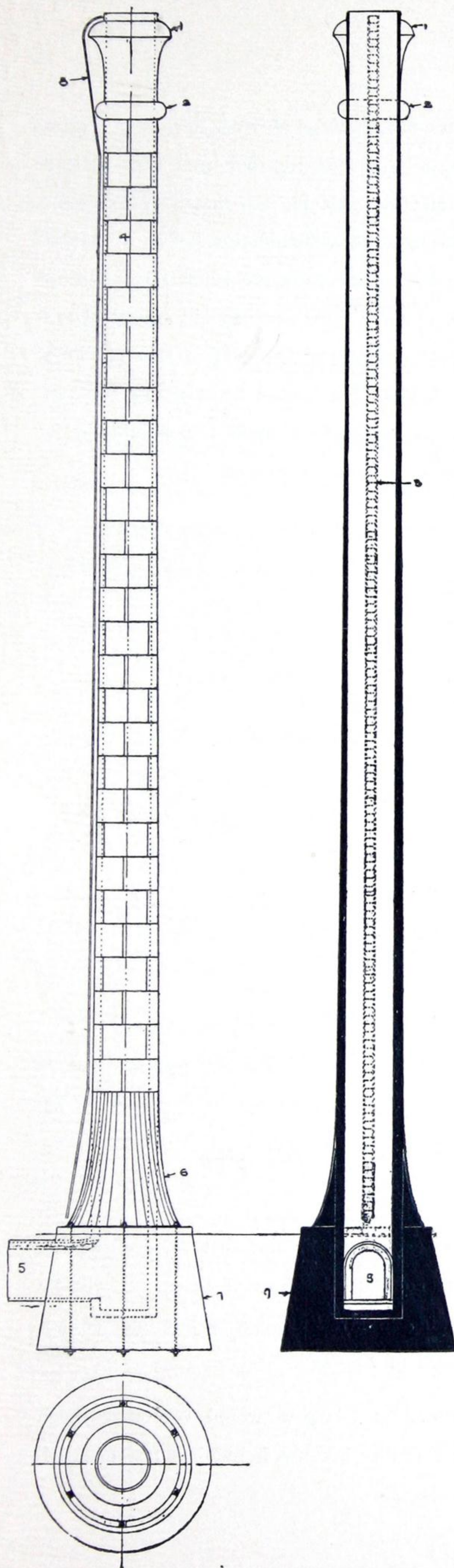
Main Office and Works :

Mifflin Street, East of Front, Philadelphia, U. S. A.

LONG DISTANCE TELEPHONE 1781.



Steel Plate Chimney 6 feet diameter by 150 feet high, built for
EAST RIVER GAS CO., LONG ISLAND CITY, N. Y.



Steel Plate Chimneys

for Blast Furnaces, Rolling Mills
and for all Kinds of Factories.

DURING the last twenty-five years, we have embraced among other lines of manufactures, that of constructing iron or steel plate chimneys, and during that time have never known any of them to fail in any particular whatever, and, moreover, contrary to what would be ordinarily supposed, constant painting has not been required. In fact, it is doubtful if these chimneys have received a coat of paint once in five years on the average. As many engineers may think that iron or steel plate chimneys are mere tin affairs, requiring guys, and are only to be thought of in connection with an indifferent plant, we would state that some of the largest chimneys to be found anywhere have been constructed of iron or steel.

These shafts, rearing into the air 200 to 300 feet, are not only an excellent protection against lightning storms, but an excellent advertisement, which no one overlooks in business nowadays.

It is surprising that a chimney constructed of so many pieces of burnt clay, laid together in a mortar that of itself has no tenacity whatever (the mortar of a brick chimney which has been heated and cooled a few

times) should be preferred by thinking engineers to a casing of steel having a tensile strength of 60,000 pounds per square inch, securely riveted together and then solidly bolted through to the bottom of the foundation, and so stable indeed, that if pulled upon from the top it would upset from the very bottom of the foundation before it would noticeably bend through the length of the long shaft. The ordinary brick stack has to be considered as having a possible failing point at every joint, and should be calculated in its successive steps of thicker to thinner walls to determine the point of least stability. As an exhibit of such calculations, Rankine's Applied Mechanics, pp. 240-243 may be referred to. Turning to the appendix therein, his calculations upon the stability of a 455½ feet stack situated in Glasgow, Scotland, will be found as follows:

Dimensions and stability of the outer shell of the great Chimney at St. Rollox.

Divisions of Chimney.	Height above ground.	External Diameters.		Thicknesses.		Greatest pres- sure of wind consistent with security.
	Feet.	Ft.	In.	Ft.	In.	Lbs. per sq. ft.
V.	{ 435½	13	6	· · · · ·	1 2	77
IV.	{ 350½	16	9	· · · · ·	1 6	55*
III.	{ 210½	24	0	· · · · ·	1 10½	57
II.	{ 114½	30	6	· · · · ·	2 3	63
I.	{ 54½	35	0	· · · · ·	· · · · ·	71
	{ 0	40	0	· · · · ·	2 7½	

Total height from base of foundation to top of chimney, 455½ feet.

*Joint of least stability.

This shows a different factor of stability at each section, and that as a whole the chimney may be considered as having a strength equal to the least of these. It will be noticed that the least factor is 55, which, according to Mr. Rankine, is just four pounds above the highest noted wind pressure, in the west of England.

A steel plate chimney substituted for this one at Glasgow would cost very much less money, and would require less weight. The former because it requires less material,

and the latter because it presents much less surface to the action of the wind, moreover, the base would be spread toward the bottom, thereby securing extra stability. This is exemplified by comparing the stability of a cylinder of light wood having a piece of sheet lead tacked on the bottom, of about twice the diameter of the wood, with that of another piece of wood of the same diameter as the lead, but of a heavier material, and weighing the same as the former piece of lead and wood together. It will be found that the small cylinder with the piece of lead is infinitely more stable than the heavier piece of wood having the same base.

In our practice throughout the United States, we have assumed that fifty pounds wind pressure per square foot would be the highest really worth considering. No record has reached us showing so high a pressure of wind, and it will be observed from the following calculations that if it does, it will have to exceed anything yet heard of, and sweep every building in the line of the hurricane before one of these chimneys would be in the least affected.

As to the efficiency of the draft, it may be stated that the members of the American Society of Mechanical Engineers, in several recent debates upon chimney draft and chimney construction, have expressed themselves confident that an iron casing is superior to a brick one, in that it does not leak and draw in cold air, and thus impair its draft. Also, when it is considered that an ordinary chimney will discharge, under a full headway, 130,000 pounds of gas per hour, it will be readily conceived that the ascending column of heated gas can sustain but very small loss by radiation through the shell, even though the shell is entirely unlined.

Our practice covers the full-lined, half-lined and unlined shells. For ordinary boiler purposes the latter is quite satisfactory. Even though the wasteful temperature of 600° Fahr. is assumed for the escaping gas, and the temperature of the atmosphere outside is assumed at 100°, the average of 350° would be about the temperature of the shell of the chimney, and this would be only that of steam at 135 pounds absolute, which no one would assume to be injurious to the shell of a boiler. As to the strength of these structures, during an exhaustive number of tests made by Sir William Fairbairn (which experiments are now often referred to as the basis of calculations upon iron and steel structures), four carefully executed experiments were made to determine the strength of thin, hollow tubes. In the following table will be found the dimensions of their several elements with their breaking strains. These tubes were placed upon hollow blocks, and the weights suspended at the center from the block carefully fitted to the inside.

TABLE OF SIR WILLIAM FAIRBAIRN'S EXPERIMENTS.

	Clear Span. Feet.	Thickness Iron, Ins.	Outside Diam. Ins.	Sectional Area, Sq. Ins.	Breaking Weight, Lbs.	Breaking Weight by Clark's Formula. Constant 1.2 Lbs.
I.	17'	.037	12.	1.3901	2,704	2,627
II.	15'.7 1/2''	.113	12.4	4.3669	11,440	9,184
III.	23'.5''	.0631	17.68	3.487	6,400	7,302
IV.	23'.5''	.119	18.18	6.74	14,240	13,910

Mr. Edwin Clarke has formulated a rule, from experiments conducted by him, in the use of iron and steel for hollow tube bridges, which is as follows:

$$(1) \quad \text{Center breaking load in tons} = \frac{\left\{ \begin{array}{l} \text{Area of material} \\ \text{in inches.} \end{array} \times \begin{array}{l} \text{Mean depth} \\ \text{in inches} \end{array} \times \text{Constant.} \right\}}{\text{Clear span in feet.}}$$

When the constant used is 1.2, the calculation for the tubes experimented upon by Mr. Fairbairn are given in the last column of the above table.

D. K. Clark's "Rules, Tables and Data for Mechanical Engineers," page 513, gives the following rule for hollow tubes:

$$(2) \quad W = \frac{3.14 D^2 TS}{L}$$

W = Breaking weight in pounds in center.

D = Extreme diameter in inches.

T = Thickness in inches.

L = Length between supports in inches.

S = Ultimate tensile strength in pounds per square inch.

Taking S, the strength of a square inch of a riveted joint at 35,000 pounds, this rule figures as follows for the different examples experimented upon by Mr. Fairbairn:

$$\begin{array}{llllll} \text{I.} & 3.14 \times 144 & \times 0.037 & \times 35,000 \div 204 & = & 2,870 \\ \text{II.} & 3.14 \times 153.76 & \times 0.113 & \times 35,000 \div 187.5 & = & 10,190 \\ \text{III.} & 3.14 \times 312.5 & \times 0.0631 & \times 35,000 \div 282 & = & 7,700 \\ \text{IV.} & 3.14 \times 330.5 & \times 0.119 & \times 35,000 \div 282 & = & 15,320 \end{array}$$

A close approximation between the breaking weights obtained by his experiments and those derived from Mr. Edwin Clarke's and Mr. D. K. Clark's rules will be observed. It may be assumed, therefore, that this system of calculation is practically correct, and that it is eminently safe when a large factor of safety is provided, and from the fact

that a chimney may be standing for many years without receiving anything like the strain taken as the basis of the calculation—fifty pounds per square foot. Wind pressure at fifty pounds per square foot may be assumed to be traveling in a horizontal direction and be of the same velocity at all points between the top and the bottom of the stack. This is the extreme assumption. If however, the chimney is round, its effective area will be only half of its diametral plane, that is, the entire force on round chimneys is concentrated in the center of the height of the section of the chimney to be considered.

Taking the average diameter of a 125 feet chimney as 90 inches, the effective surface in square feet upon which the force of the wind may act will, therefore, be $7\frac{1}{2}$ times 125 divided by 2, which multiplied by 50, gives a total wind force of 23,437 pounds. The resistance of the chimney to breaking across the top of the foundation would be 3.14×168^2 (that is, diameter of base), multiplied by $.25 \times 35,000 \div (750 \times 4) = 258,486$, or 10.6 times the entire force of the wind. We multiply the half height above the joint in inches 750 by 4 because the chimney is considered a fixed beam with a load suspended at one end.

In calculating its strength half-way up, we have a beam of the same character, the beam in this case being fixed at a point half-way up the chimney, where it is 90 inches in diameter and .187 inch thick. Taking the diametral section above this point and the force as concentrated in the center of it, or half-way up from the point under consideration, its breaking strength is: $3.14 \times 90^2 \times 0.187 \times 35,000 \div (381 \times 4) = 109,220$. The force of the wind to tear it apart through its cross-section at this line, $7\frac{1}{4} \times 62\frac{1}{2} \times 50 \div 2 = 11,352$, or a little more than one-tenth of the strength of the stack.

It may be asked why are these stacks built so strong, or equal to ten times the heaviest load. It is that in introducing a relatively new thing, and presenting a light structure to supplant that of the massive brick chimneys, a certain degree of prejudice had to be overcome, and further, it is an unanswerable reply to the objection that these stacks will weaken in time by rusting and getting thin. It will be seen from the calculations that they may be impaired to the extent of three-quarters of their thickness and still far exceed in stability any brick structure ever reared.

In constructing the foundation for these stacks, the rules applicable to brick stacks and all tall structures have been employed, assuming that the center of gravity had to be moved a certain distance with the force of the wind. In steel stacks however, the center of gravity is very low, as the weight is so largely in the foundation. Then, again, the diameter of the base is very large, and is secured by powerful bolts passing through it.

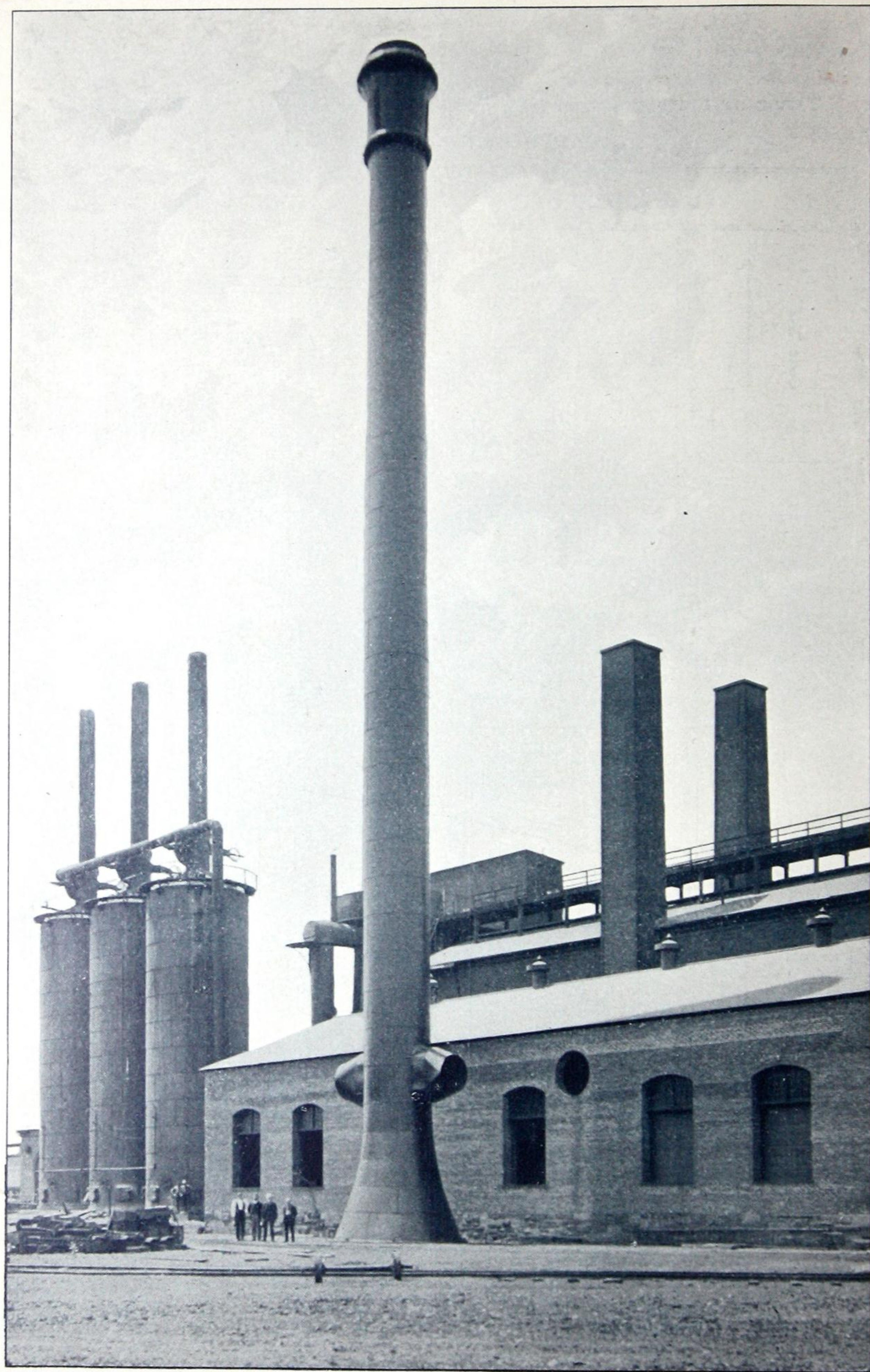
TABLE OF SIZES BUILT BY THE PHILADELPHIA ENGINEERING WORKS, LTD.
PRICES SUBMITTED ON APPLICATION.

FULL LINED								HALF LINED							
Code Word.	Horse-Power.	Diameter in Clear.	Height.	Coal Consumed per Hour.	Total Area of Grate Surface Required.	Least Diameter Foundation.	Least Depth Foundation.	Code Word.	Horse-Power.	Diameter in Clear.	Height.	Coal Consumed per Hour.	Total Area of Grate Surface Required.	Least Diameter Foundation.	Least Depth Foundation.
Sixpence	160	32	70	800	53	12'-7"	5	Skunkhead	188	36	70	940	63	12'-7"	5
Sixscore	170		80	850	57	14'-3"	5-6	Skurry	201		80	1,005	67	14'-3"	5-6
Sixteen	178		90	890	59	14'-9"	6	Skute	213		90	1,065	71	14'-9"	6
Sixth	188		100	940	63	15'-9"	6	Sky	223		100	1,115	74	15'-9"	6
Sixty	188	36	70	940	63	12'-7"	6	Skylark	225	40	70	1,125	75	12'-7"	6
Size	201		80	1,005	67	14'-3"	6	Skylight	240		80	1,200	80	14'-3"	6
Sizeness	213		90	1,065	71	14'-9"	6-6	Skyrocket	260		90	1,300	86	14'-9"	6-6
Sizzle	223		100	1,115	74	15'-9"	6-6	Skysail	270		100	1,350	90	15'-9"	6-6
Sizzling	236		110	1,180	79	16'-10"	6-6	Skyward	285		110	1,425	95	16'-10"	6-6
Skaddle	237	39	80	1,185	79	13'-7"	6	Slab	301	44	80	1,505	100	13'-7"	6
Skain	251		90	1,255	83	14'-3"	6	Slabber	319		90	1,595	106	14'-3"	6
Skainer	265		100	1,325	88	15'-9"	6-6	Slabby	337		100	1,685	112	15'-9"	6-6
Skall	277		110	1,385	92	16'-10"	6-6	Slack	353		110	1,765	118	16'-10"	6-6
Skar	290		125	1,450	96	17'-9"	7	Slackness	374		125	1,870	125	17'-9"	7
Skate	300	43	80	1,500	100	13'-7"	6	Slade	380	48	80	1,900	126	13'-7"	6
Skater	315		90	1,575	105	15'-3"	6	Slag	410		90	2,050	136	15'-3"	6
Skedaddle	330		100	1,650	110	16'-4"	6	Slaggy	430		100	2,150	143	16'-4"	6
Skeel	350		110	1,750	116	17'-0"	6-6	Slate	450		110	2,250	150	17'-0"	6-6
Skeleton	370		125	1,850	123	18'-5"	7	Slam	475		125	2,375	158	18'-5"	7
Skelley	410	48	90	2,050	136	14'-3"	7	Slamming	500	54	90	2,500	166	14'-3"	7
Skelp	430		100	2,150	143	15'-3"	7	Slander	520		100	2,600	173	15'-3"	7
Skeptic	450		110	2,250	150	16'-10"	7	Slanderous	540		110	2,700	180	16'-10"	7
Sketch	475		125	2,375	158	17'-6"	7-6	Slang	570		125	2,850	190	17'-6"	7-6
Sketcher	525		150	2,625	175	19'-5"	8	Slap	630		150	3,150	210	19'-5"	8
Skew	510	56	90	2,550	170	15'-3"	8	Slanting	596	60	90	2,980	199	15'-3"	8
Skewarch	537		100	2,675	178	16'-4"	7	Slapping	628		100	3,140	209	16'-4"	7
Skewback	564		110	2,820	191	18'-0"	7	Slapjack	660		110	3,300	220	18'-0"	7
Skewbald	596		125	2,980	199	19'-5"	7	Slash	697		125	3,485	232	19'-5"	7
Skid	652	60	150	3,250	216	20'-4"	9	Slashing	766	66	150	3,830	255	20'-4"	9
Skiff	710		175	3,600	240	22'-7"	9	Slatting	835		175	4,175	278	22'-7"	9
Skill	786		200	3,830	255	23'-8"	10	Slaughter	900		200	4,500	300	23'-8"	10
Skillful	628		60	100	3,140	209	17'-4"	8	Slaw		760	66	100	3,800	253
Skilling	660	110		3,300	220	18'-0"	9	Slay	800	110	4,000		266	18'-0"	9
Skim	697	125		3,485	232	19'-5"	9	Slave	843	125	4,215		281	19'-5"	9
Skinner	766	150		3,830	255	21'-4"	9	Slaveborn	927	150	4,635		309	21'-4"	9
Skimmilk	835	66	175	4,175	278	23'-8"	9	Slayer	1010	72	175	5,050	336	23'-8"	9
Skink	905		200	4,525	301	24'-9"	10	Sleave	1095		200	5,475	365	24'-9"	10
Skinless	760		100	3,800	253	18'-0"	7	Slavery	904		100	4,520	301	18'-0"	7
Skinmed	843		125	4,215	281	20'-4"	7	Slaveship	1003		125	5,015	334	20'-4"	7
Skip	927	66	150	4,635	309	21'-10"	8	Sleaved	1102	78	150	5,510	367	21'-10"	8
Skipper	1010		175	5,050	346	23'-8"	9	Slavic	1200		175	6,000	400	23'-8"	9
Skipjack	1095		200	5,475	365	25'-0"	10	Slaver	1300		200	6,500	433	25'-0"	10
Skirmish	904		72	100	4,520	301	18'-0"	7	Sled		1061	78	100	5,305	353
Skirt	1003	125		5,015	334	20'-4"	8	Sledge	1177	125	5,885		392	20'-4"	8
Skirting	1102	150		5,510	367	22'-7"	8	Sleek	1295	150	6,475		432	22'-7"	8
Skittish	1200	175		6,000	400	24'-2"	9	Sleekness	1413	175	7,065		471	24'-2"	9
Skiver	1300	75	200	6,500	433	25'-9"	10	Sleep	1530	84	200	7,650	510	25'-9"	10
Skow	1400		225	7,000	466	26'-10"	11	Sleeper	1648		225	8,240	549	26'-10"	11
Skrumpy	1090		125	5,450	363	20'-4"	8-6	Sleeping	1366		125	6,830	455	20'-4"	8-6
Skringe	1200		150	6,000	400	22'-7"	9	Sleet	1501		150	7,505	500	22'-7"	9
Skull	1300	75	175	6,500	433	24'-2"	10	Sleeve	1630	84	175	8,150	543	24'-2"	10
Skullcap	1400		200	7,000	466	25'-9"	10-6	Sleigh	1800		200	9,000	600	25'-9"	10-6
Skulfish	1520		225	7,600	506	26'-10"	12	Sleighting	1935		225	9,675	645	26'-10"	12
Skunk	1640		250	8,200	546	29'-8"	12	Slender	2060		250	10,300	686	29'-8"	12

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FULL LINED								HALF LINED								
Code Word.	Horse-Power.	Diameter in Clear.	Height.	Coal Consumed per Hour.	Total Area of Grate Surface Required.	Least Diameter Foundation.	Least Depth Foundation.	Code Word.	Horse-Power.	Diameter in Clear.	Height.	Coal Consumed per Hour.	Total Area of Grate Surface Required.	Least Diameter Foundation.	Least Depth Foundation.	
Slice	1300	81	125	6,500	433	20'-4"	8	Slyness	1560	90	125	7,800	520	20'-4"	8	
Slick	1400		150	7,000	466	23'-8"	8-3	Smack	1700		150	8,500	560	23'-8"	8-3	
Slickness	1505		175	7,525	501	24'-9"	10	Small	1840		175	9,200	613	24'-9"	10	
Slide	1610		200	8,050	536	26'-10"	10	Smallness	1980		200	9,900	660	26'-10"	10	
Slider	1715		225	8,575	571	28'-5"	11	Smart	2120		225	10,600	706	28'-5"	11	
Sliding	1820		250	9,100	606	30'-8"	11	Smarting	2260		250	11,300	753	30'-8"	11	
Slight	1486	87	125	7,430	495	20'-4"	8-0	Smartness	1836	96	125	9,180	612	20'-4"	8	
Slightness	1610		150	8,050	536	23'-8"	9-0	Smear	1989		150	9,945	663	23'-8"	9	
Slim	1734		175	8,670	578	25'-3"	10-0	Smearing	2142		175	10,710	714	25'-3"	10	
Slimness	1855		200	9,275	618	27'-4"	11	Smell	2296		200	11,480	765	27'-4"	11	
Sling	1982		225	9,910	660	28'-11"	11	Smelling	2449		225	12,245	816	28'-11"	11	
Slinger	2106		250	10,730	702	30'-8"	12	Smelless	2602		250	13,010	867	30'-8"	12	
Slip	2230	275	11,150	743	33'-0"	11	Smelt	2755	275	13,775	918	33'-0"	11			
Slipping	1672	93	125	8,350	556	21'-7"	9	Smelter	2040	102	125	10,200	680	21'-7"	9	
Slipper	1833		150	9,165	611	23'-8"	10	Smile	2210		150	11,050	736	23'-8"	10	
Slipknot	1974		175	9,870	658	25'-9"	10	Smileless	2380		175	11,900	793	25'-9"	10	
Sliplink	2115		200	10,575	705	26'-10"	11	Smith	2550		200	12,750	850	26'-10"	11	
Slipshod	2256		225	11,280	752	28'-11"	11-6	Smoke	2720		225	13,600	906	28'-11"	11-6	
Sliver	2397		250	11,975	798	30'-8"	13	Smokebox	2890		250	14,450	963	30'-8"	13	
Sloop	2538	275	12,690	846	33'-0"	12	Smoker	3060	275	15,300	1020	33'-0"	12			
Slop	1926	99	125	9,630	642	21'-7"	9	Smokiness	2289	108	125	11,445	763	21'-7"	9	
Sloppy	2086		150	10,430	695	23'-8"	10	Smolder	2480		150	12,400	816	23'-8"	10	
Sloppiness	2246		175	11,030	735	25'-9"	10	Smooth	2671		175	13,355	890	25'-9"	10	
Slot	2406		200	12,030	802	26'-10"	12	Smuggler	2862		200	14,310	954	26'-10"	12	
Slotted	2566		225	12,830	855	28'-11"	12	Smut	3053		225	15,265	1017	28'-11"	12	
Slouch	2726		250	13,630	908	31'-8"	12	Snag	3244		250	16,220	1081	31'-8"	12	
Sloven	2886	275	14,430	962	33'-6"	12		3435	275	17,175	1145	33'-6"	12			
Slow	2289	108	125	11,445	763	22'-7"	9	Snail	2826	120	125	14,130	942	22'-7"	9	
Slowness	2480		150	12,400	816	23'-8"	11	Snake	3061		150	15,305	1020	23'-8"	11	
Slug	2671		175	13,355	890	25'-9"	11	Snap	3296		175	16,480	1096	25'-9"	11	
Sluggard	2862		200	14,310	954	27'-10"	12	Snappish	3531		200	17,655	1177	27'-10"	12	
Sluggish	3053		225	15,265	1017	29'-11"	12	Snare	3756		225	18,780	1252	29'-11"	12	
Sluice	3244		250	16,220	1081	31'-8"	13	Snatch	3991		250	19,955	1330	31'-8"	13	
Sluicy	3435	120	275	17,175	1145	34'-0"	13	Sneak	4226	275	21,130	1408	34'-0"	13		
Slum	3626		300	18,130	1208	36'-0"	13	Sneer	4461	300	22,305	1453	36'-0"	13		
Slumber	2826		120	125	14,130	942	22'-7"	9	Sneerful	3423	132	125	17,115	1141	22'-7"	9
Slump	3061			150	15,305	1020	24'-8"	10	Sniff	3710		150	18,550	1236	24'-8"	10
Slungshot	3296			175	16,450	1096	25'-9"	10	Snipe	3990		175	19,950	1330	25'-9"	10
Slur	3531			200	17,655	1177	28'-10"	12	Snob	4270		200	21,350	1423	28'-10"	12
Slurring	3756	225		18,780	1252	29'-11"	13	Snobbish	4550	225		22,750	1516	29'-11"	13	
Slush	3991	250		19,955	1330	31'-8"	14	Snooze	4835	250		24,175	1650	31'-8"	14	
Sluttish	4226	120	275	21,130	1408	34'-0"	14	Snort	5120	275	25,600	1706	34'-0"	14		
Sly	4461		300	22,305	1453	36'-0"	14	Snow	5400	300	27,000	1800	36'-0"	14		



Steel Plate Chimney 6 feet 3 inches diameter by 150 feet high, built for
THE BURDEN IRON COMPANY, TROY, N. Y.

TESTIMONIAL LETTERS

FROM PARTIES FOR WHOM WE HAVE BUILT

STEEL PLATE CHIMNEYS.

CHIMNEY 20 YEARS IN USE.

IRONTON, OHIO, Oct. 28, 1893.

Fred W. Gordon, Esq., Chairman Philadelphia Engineering Works, Ltd., Philadelphia.

DEAR SIR:—The Etna Iron Works of this city, built in 1874, elected to construct a Plate Chimney for the draft of their boilers and fire-brick stoves.

It is 9 feet in diameter and 200 feet high, and similar, so far as I can judge, to those you are now erecting throughout the country.

This chimney is situated in an exposed position on the banks of the Ohio River, and has, in its 20 years of existence, withstood several wind storms

It has superior durability and stability, while the draft is excellent. I consider it far superior to any brick structure I am acquainted with.

Very truly yours,

GEO. WILLARD,

Formerly President Etna Iron Works, Ironton, O.

HARTMAN GENERAL ELECTRIC CO.

DULUTH, MINN., Oct. 14, 1893.

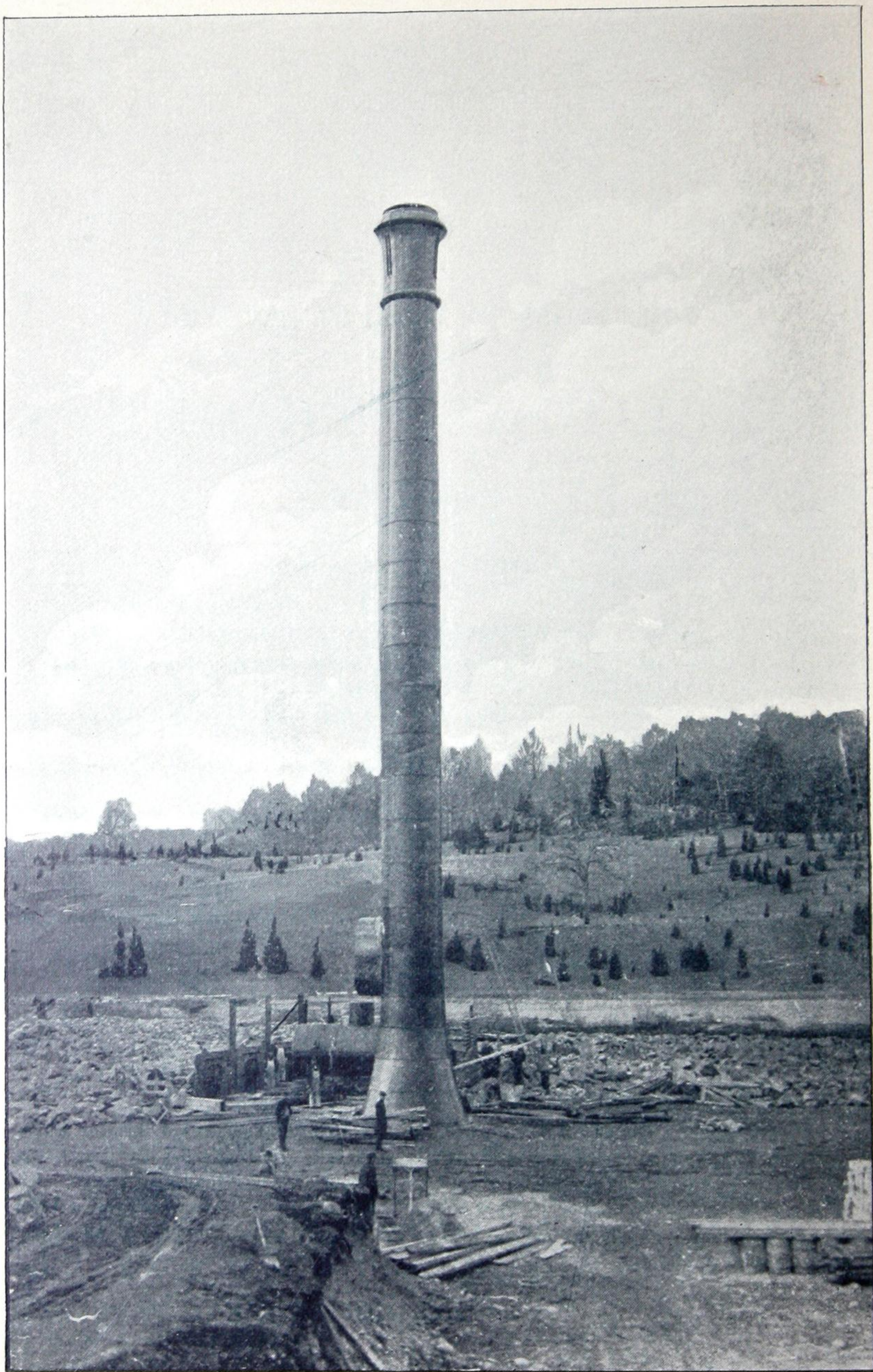
Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—The Steel Plate Chimney, 208 feet high and 98 inches in diameter, which you erected at our new Central Station Electric Lighting Plant in this city, has now been in use for four months. We are greatly pleased with the chimney, and believe it is the best chimney that can be used. Aside from its business utility, the stack is so well proportioned that it has already become one of the sights of the city. Thus far it has more than fulfilled all of our expectations.

Yours truly,

HARTMAN GENERAL ELECTRIC CO.,

By A. W. HARTMAN, *Prest.*



Steel Plate Chimney 6 feet diameter by 100 feet high, built for
THE ASPINOOK COMPANY, JEWETT CITY, CONN.

WALDO & STOUT,
ALUMINUM, SILICON & MANGANESE BRONZE.

BRIDGEPORT, CONN., Oct. 11, 1893.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—We have been using one of your 75 feet chimneys for about a year and a half, and it has proved extremely satisfactory, combining extraordinary strength without the use of guys, together with a pleasing and ornamental appearance. We have recommended it to numerous business houses who have inquired of us, having seen our chimney from a distance.

Yours truly,

WALDO & STOUT.

EAST RIVER GAS COMPANY.

LONG ISLAND CITY, N. Y., Oct. 11, 1893.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—In response to your request of the 10th, we are pleased to say to you, formally, that satisfaction has been given by the chimney which you have recently completed for us.

Concerning the draft we can say but little as yet, on account of the chimney having been designed for a considerably larger capacity of boilers than we are now using. We have to throttle it down. As a mechanical structure, we cannot say too much in its praise. During the recent cyclonic storms we naturally felt considerable solicitude as to whether it would out-ride them. During the height of these storms, however, with a perceptible sway at the top, no vibration, even, could be discovered by placing one's hand on the lower courses of sheeting. Shall be pleased to give you results we obtain when using the chimney to its designed capacity; that they will be satisfactory, we have no doubt.

Yours truly,

D. L. HOUGH,
Engineer.

CALUMET ELECTRIC STREET RAILWAY COMPANY.

CHICAGO, ILLS., Oct. 16, 1893.

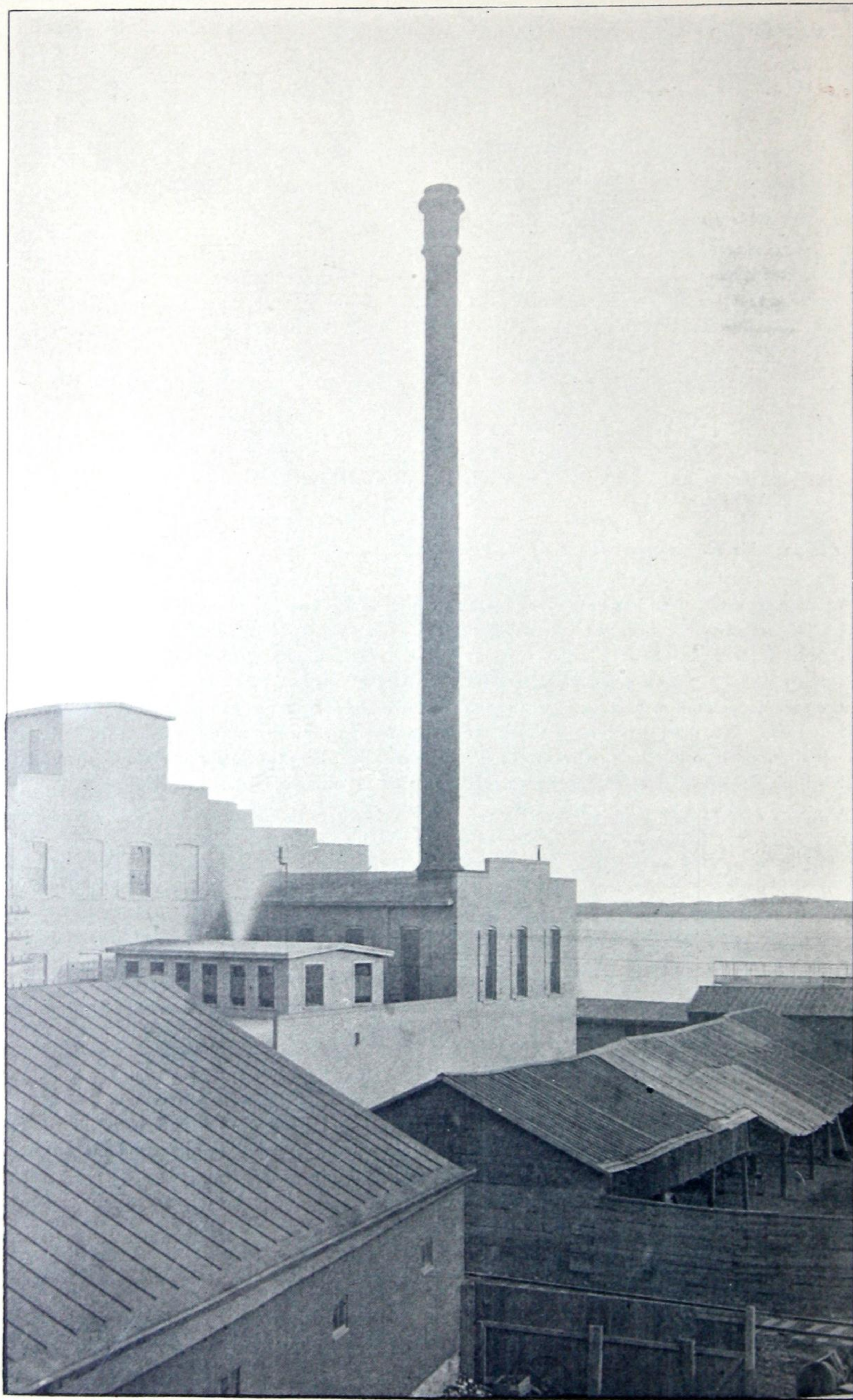
Philadelphia Engineering Works, Limited, Philadelphia, Pa.

GENTLEMEN:—The Iron Chimney erected by you for us last spring is doing excellent work. This chimney is constructed on a heavy masonry foundation to a height of 115 feet. We have demanded of this stack a draft for 1250 HP, and have always had sufficient draft during all conditions of weather. The stack is very much exposed to the elements on the prairies that surround our works, and has been subjected to a wind going at least 60 miles per hour, but it stands strong and stiff against this pressure.

We have reason to believe that we could not have put up a better chimney for our needs. It is an excellent structure, and looks well. We certainly cheerfully recommend it very highly.

Yours, very truly,

F. O. RUSLING,
Gen. Supt.



Steel Plate Chimney 4 feet 6 inches diameter by 125 feet high, built for
THE PATENT CEREALS Co., GENEVA, N. Y.

RUMFORD FALLS PAPER COMPANY.

RUMFORD FALLS, ME., Oct. 28, 1893.

Philadelphia Engineering Works, Limited, Philadelphia, Pa.

GENTLEMEN:—Referring to yours of the 10th, would say that we are perfectly satisfied with the Steel Plate Chimney furnished us by your Company. It is both sightly and efficient, and its economy in cost, as compared with brick stacks of the same capacity, is beyond question.

Yours truly,

GARRET SCHENCK,
Gen. Manager.

EUREKA TEMPERED COPPER CO.

NORTH EAST, PA., 10-12-93.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

DEAR SIR:—We have used one of your Steel Plate Chimneys, which was completed something over a year ago. We believe that they are the best chimney in the world. It has given perfect satisfaction in every way, and has not cost us a moment's trouble since we purchased it. We are on the banks of the lake, here, where we have severe south winds, but apparently it does not affect the chimney in the least.

Yours truly,

ALFRED SHORT,
Prest. & Gen. Mgr.

THE ELMIRA ILLUMINATING CO.

ELMIRA, N. Y., Oct. 13, 1893.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—Replying to your favor of the 9th inst., would say that the chimney which you erected for us last summer has given perfect satisfaction in every way, and more than meets our expectations.

We believe the chimney is far better in every way than brick, and a much more safe one on account of the impossibility of damage by lightning, as well as its power to resist wind pressure.

Yours truly,

THE ELMIRA ILLUMINATING CO.,
F. A. CHENEY, *Gen. Mgr.*

SPRAGUE ELECTRIC ELEVATOR COMPANY,
253 BROADWAY.

NEW YORK, Nov. 22, 1894.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—We beg to reply to your favor of Nov. 16th. We have now had the Steel Plate Stack you erected for us in place for nearly a year. It is mounted on an exceptionally high foundation, and has been subjected to the full strength of some pretty high winds and storms. It has never shown any weakness, and has altogether thus far proved all that was claimed for it. We take pleasure in commending your work. If erecting another chimney, we would most favorably consider a proposition from you.

Very truly yours,

SPRAGUE ELECTRIC ELEVATOR COMPANY,
By FRANK J. SPRAGUE, *Vice-Prest.*



Steel Plate Chimney 6 feet diameter by 150 feet high, built for
THE UNION CAR CO., DEPEW, N. Y.

THE ASPINOOK COMPANY.

JEWETT CITY, CONN., Nov. 23, 1894.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—Replying to yours of the 15th inst., we take pleasure in stating that the Steel Plate Chimney which was constructed by you, and which has been in use for nine months or more, has given entire satisfaction.

Very truly yours,

THE ASPINOOK COMPANY,
O. L. JOHNSON, JR., *Treasurer.*

THE UNITED GLASS CO.

MANUFACTURERS OF WINDOW GLASS.

THE MANHATTAN, 1417.

CHICAGO, ILL., Nov. 20, 1894.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

DEAR SIR:—In reply to your favor of the 16th inst., addressed to us at Alexandria, Ind. You erected a Steel Plate Chimney last year, at our factory in West Alexandria, Ind., 125 feet in height from top of foundation, lined with fire brick, and 6 feet in diameter in the clear.

We take pleasure in saying that the chimney was built strictly according to the plans and specifications, and that we are entirely satisfied with your work.

The graceful form and proportions of this chimney have called forth words of commendation and praise from many who have seen it.

Yours, very truly,

THOMAS D. CATLIN,
President.

THE UNION CAR COMPANY.

BUFFALO, N. Y., Nov. 19, 1894.

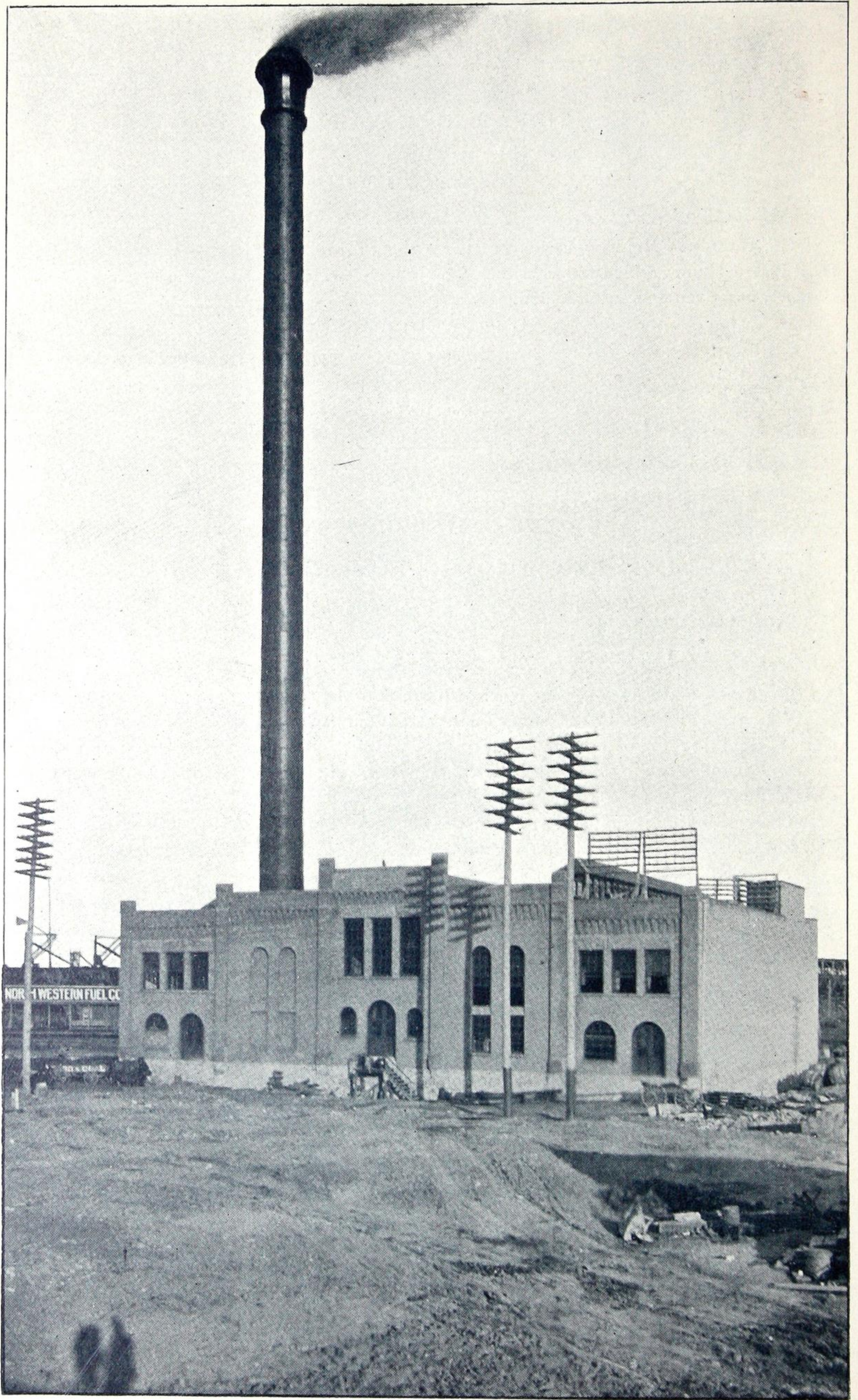
Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—Replying to your favor of the 15th. The Steel Stack you erected for us at Depew, N. Y., last spring, has so far given entire satisfaction.

The stack has been very much admired, and seems to answer perfectly in place of a brick stack, which would have cost us a great deal more money.

Yours, truly,

H. H. HEWITT,
Gen. Manager.



Steel Plate Chimney 7 feet 6 inches diameter by 200 feet high, built for
HARTMAN GENERAL ELECTRIC Co., DULUTH, MINN.

BARRETT BREWING COMPANY.

CLEVELAND, OHIO, Nov. 23, 1894.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—Your esteemed favor of even date noted. The Steel Plate Chimney that you erected for our Company is all that you claim for it; is durable, works well, and makes a good appearance. We are well pleased with your work; also, with the treatment of your Company.

Yours, respectfully,

BARRETT BREWING CO.

THE PATENT CEREALS COMPANY.

GENEVA, N. Y., Nov. 28, 1894.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—Replying to your letter of recent date, would say that the stack you erected for us about a year ago has given us good satisfaction.

In spite of the prevailing high winds we have in this section, it appears to stand as firm as when put up.

Yours, truly,

THE PATENT CEREALS COMPANY.

STROUDSBURG WOOLEN MILLS.

STROUDSBURG, PA., Nov. 20, 1894.

Philadelphia Engineering Works, Ltd., Philadelphia, Pa.

GENTLEMEN:—Replying to your favor of the 17th inst. The Steel Plate Chimney, 40' x 60', that I got of you in 1893, so far has given entire satisfaction.

Yours, respectfully,

THOMAS KITSON.

These Chimneys can be erected to a great height without excessive cost, and serve as an excellent advertisement.

PHILADELPHIA ENGINEERING WORKS, LIMITED.

List of Works for which we have Designed or Built Iron Chimneys.

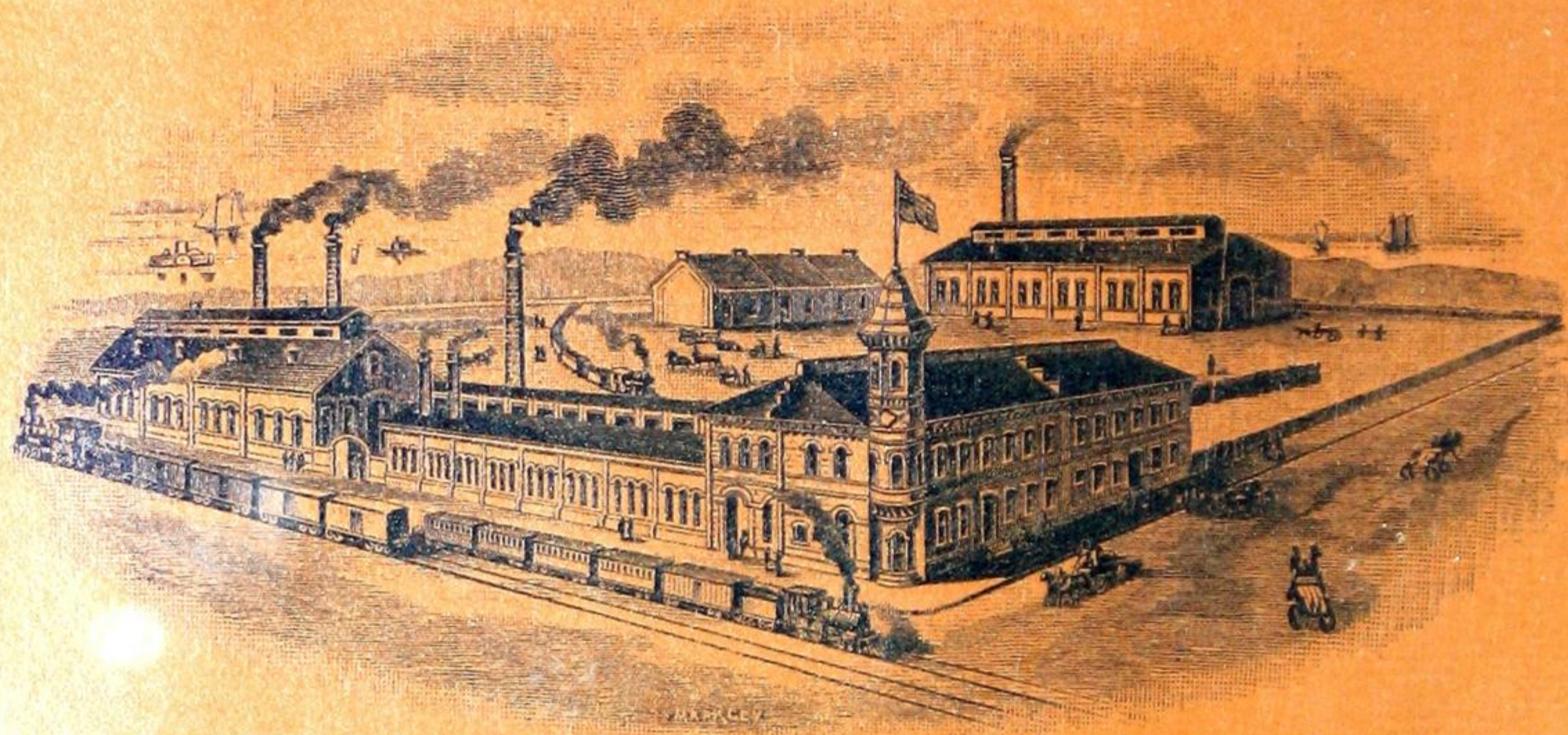
Ranging from 3 feet diameter by 125 feet high to 11 feet
diameter by 225 feet high.

Robesonia Iron Co.,	Robesonia, Pa.
Bird Coleman Furnaces,	North Cornwall, Pa.
Colebrook Furnaces,	Lebanon, Pa.
Powelton Furnaces,	Saxton, Pa.
Neshannock Furnace,	New Castle, Pa.
Spearman Furnace,	Sharpsville, Pa.
Isabella Furnace Co.,	Pittsburgh, Pa.
Dunbar Furnace Co.,	Dunbar, Pa.
Crozer Iron Co.,	Roanoke, Va.
Princess Furnace,	Glen Wilton, Va.
Ashland Furnace,	Ashland, Ky.
Citico Furnace Co.,	Chattanooga, Tenn.
Sewanee Furnace Co.,	Cowan, Tenn.
Rising Fawn Furnace,	Rising Fawn, Ga.
Eureka Tempered Copper Co.,	North East, Pa.
Mary Pratt Furnace,	Birmingham, Ala.
Sheffield and Birmingham Coal, Iron and R. R. Co., (three stacks)	Sheffield, Ala.
Sloss Furnaces. (four stacks)	Birmingham, Ala.
Decatur Iron Furnace,	Decatur, Ala.
Lone Star Iron Co.,	Jefferson, Texas.
Belfont Iron Works,	Ironton, Ohio.
Etna Iron Works,	Ironton, Ohio.
Means, Kyle & Co.,	Hanging Rock, Ohio.
Ohio Iron and Steel Co.,	Zanesville, Ohio.
Cleveland Rolling Mill Co.,	Cleveland, Ohio.
Union Works,	Chicago, Ill.
Martel Furnace,	St. Ignace, Michigan.
Duluth Iron and Steel Co.,	Duluth, Minn.
Jupiter Iron Works,	St. Louis, Mo.
Missouri Furnaces,	St. Louis, Mo.
Perth Amboy Terra Cotta Co.,	Perth Amboy, N. J.
Stanley G. Flagg & Co.,	Philadelphia, Pa.
Tonawanda Iron & Steel Co.,	Buffalo, N. Y.
Waldo & Stout,	Bridgeport, Conn.
Elmira Illuminating Co.,	Elmira, N. Y.
Scranton Traction Co.,	Scranton, Pa.
Rumford Falls Paper Co.,	Rumford Falls, Me.
Calumet Street R. R. Co.,	Chicago, Ill.
Hartman General Electric Co.,	Duluth, Minn.
Sprague Electric Elevator Co.,	Watsessing, N. J.
East River Gas Co.,	Long Island City, N. Y.
Otis Falls Pulp Co.,	Livermore Falls, Me.
United Glass Co.,	Alexandria, Ind.
Poughkeepsie Iron Co.,	Poughkeepsie, N. Y.
Barrett Brewing Co.,	Cleveland, Ohio.
Evansville Street Railway Co.,	Evansville, Ind.
Coe Brass Manufacturing Co.,	Torrington, Ct.
The Aspinook Company,	Jewett City, Conn.
City of Trenton Water Works,	Trenton, N. J.
The Patent Cereals Co.,	Geneva, N. Y.
Stroudsburg Woolen Mills,	Stroudsburg, Pa.
Union Car Company,	Buffalo, N. Y.
Philadelphia Bourse,	Philadelphia.
Department Public Charities and Correction,	Wards Island, N. Y.
Burden Iron Company,	Troy, N. Y.
Philadelphia Chemical Incinerating Co.,	Philadelphia.
Standard Steel Works,	Burnham, Pa.
Nixon Paper Co.,	Manayunk, Phila.
Williams & Clark Fertilizer Co.,	Carteret, N. J.
Hamilton Iron & Steel Co.,	Hamilton, Ontario.
Benjamin H. Lightfoot,	Bridesburg, Phila.
	Maracaibo, South America.

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CCA



WORKS:

Philadelphia Engineering Works, Limited,
MIFFLIN STREET, EAST OF FRONT,
PHILADELPHIA,
U. S. A.